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Successful surgical strategy for a cervical hemangioblastoma: Case report

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Abstract

Background: Hemangioblastomas are hypervascular lesions and hence their surgical management is challenging. In particular, if complete resection is to be attained, all feeding and draining vessels must be occluded. Although most intramedullary spinal cord tumors are treated utilizing a posterior approach, we describe an anterior surgical strategy for resection of an intramedullary cervical hemangioblastoma.

Case Description: A 36-year-old female with a spinal hemangioblastoma located in the anterior cervical spinal cord presented with a long-standing history of motor weakness of the right upper extremity. Magnetic resonance imaging revealed a large multilevel extensive syrinx and a focal intramedullary enhanced tumor at the C6 level. Angiography showed that the main feeder to the tumor was the left radicular artery (C8), which originated from the thyrocervical trunk, penetrated the dura mater, and branched both rostrally and caudally into the anterior spinal artery (ASA). Three-dimensional computer graphic images showed the tumor was located in the anterior part of the spinal cord, adjacent to and supplied by the ASA. The planned anterior surgical approach involved a total corpectomy of C6 and partial corpectomies of C5 and C7. The tumor was entirely removed despite multiple adhesions, and was successfully freed from the ASA. Patency of the ASA was confirmed utilizing intraoperative indocyanine green videoangiography. Intraoperatively, no monitoring changes were encountered. The pathological diagnosis was of a hemangioblastoma. No postoperative deficit occurred.

Conclusions: An anterior approach for the resection of an anteriorly located intramedullary spinal hemangioblastomas was successfully accomplished in this case.

Key Words: Anterior approach, hemangioblastoma, indocyanine green, spinal cord, temporary arterial occlusion, three-dimensional computer graphics

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INTRODUCTION

Spinal hemangioblastoma is the third most common intrinsic intramedullary tumor, and accounts for approximately 5% of all spinal cord tumors.[1] For spinal lesions, surgical removal is generally recommended.[7] Previously, posterior midline[2] or posterolateral approaches were recommended even for the resection of anterolateral cervical spinal cord hemangioblastomas. However, these approaches can only achieve limited ventromedial exposure of the anterior spinal artery (ASA) required for safe manipulation.[5] Consequently, these approaches are not suitable for all lesions located in the midline of the ventral cord.[6] Here, we describe how an anterolateral cervical intramedullary hemangioblastoma was successfully resected through an anterior approach. Adequate removal of the lesion and confirmation of occlusion of all feeding vessels utilizing three-dimensional (3D) computerized surgical simulation and indocyanine green (ICG) fluorescence videoangiography were achieved.

CASE DESCRIPTION

A 36-year-old female presented with weakness of her right upper extremity of 10 years duration, accompanied by progressive muscle atrophy of the right hand. Recently, she had started experiencing increasing neck pain and numbness in both her upper and lower extremities. Magnetic resonance (MR) imaging of the cervical spine demonstrated an anterolateral enhanced lesion opposite the C6 vertebral body accompanied by a multilevel proximal/distal syrinx extending from the medulla to the T4 level [Figures 1a-c].

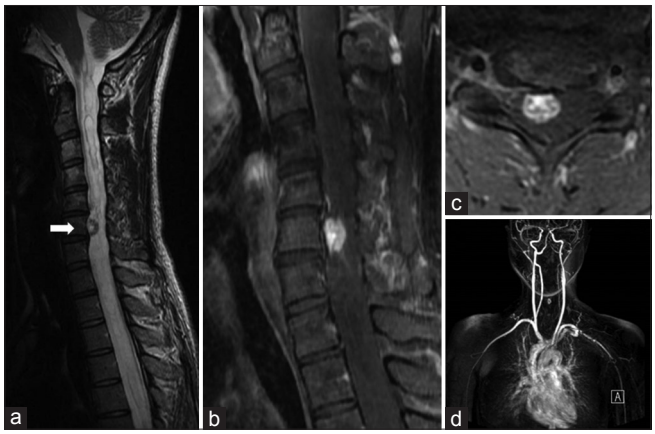

Figure 1: (a) Preoperative sagittal T2-weighted magnetic resonance (MR) image showing extensive syringobulbia and syringomyelia and a small mass (arrow) in the spinal cord at C6. (b and c) Preoperative sagittal and axial gadolinium (Gd)-enhanced MR images of the cervical spine showing a small enhanced mass in the spinal cord at C6 (b) and in the right anterior quadrant of the spinal cord (c). (d) Gd-enhanced MR angiogram of the upper parts of the body showing tumor staining in the cervical spine

MR angiography with gadolinium-diethylenet riaminepenta-acetic acid of the upper body demonstrated the C6 intramedullary anterolateral spinal cord tumor, but no other lesions [Figure 1d]. Angiography showed that the main feeding vessel was the left anterior C8 radicular artery, which originated from the thyrocervical artery, and then penetrated the dura mater and branched both rostrally and caudally into the ASA [Figure 2].

3D computed tomography (CT) angiography confirmed the same findings as the MR imaging with gadolinium [Figure 3a]. 3D computer graphic images [Figure 3b] were constructed based on these neuroradiological images, demonstrating the anatomical relationships of the spinal tumor with the surrounding structures simulating surgical visualization [Figure 3c].

Surgical resection

The intramedullary tumor was removed via an anterior approach utilizing monitoring of motor evoked potentials (MEPs) and somatosensory evoked potentials (SSEPs).[9] A left-side skin incision exposed C4 to C7, allowing for completion of a total corpectomy of C6 and partial corpectomies of C5 and C7 [Figure 4a]. Intravenous injection of ICG showed staining corresponding to the tumor, ASA, and surrounding venous drainage through the intact dura mater [Figure 4b]. The dura mater and the arachnoid membrane were then opened [Figure 4c], and ICG injection showed the ASA, tumor, feeder, and draining veins [Figure 4d]. After sharp dissection of the vessels from the arachnoid, a temporary clip with low closing force (Sugita AVM Microclip, Mizuho Medical Co., Ltd., Tokyo, Japan) was applied to the feeding artery of the tumor [Figure 4e]. ICG injection showed reduced blood flow in the feeding artery but intact flow in the ASA [Figure 4f]. Temporary artery occlusion was maintained for 30 minutes, but MEP and SSEP monitoring showed no changes. The feeding arteries were coagulated and the tumor was totally removed [Figure 4g]. The last ICG injection confirmed complete tumor excision and preservation of the ASA [Figure 4h]. The dura mater was closed with 7-0 nylon and fibrin glue. Anterior fusion from C5 to C7 was performed with an iliac bone graft fixed with a titanium plate. One day after the surgery, cervical radiography showed that the bone graft was dislodged, and hence it was replaced with a fibular graft, and accompanied by external fixation with a halo vest.

Postoperatively, the patient remained neurologically unchanged with similar motor function, however, had slight improvement in upper extremity numbness. Her dysphagia was only temporary, resolving over the 1st postoperative month. Postoperative MR imaging confirmed total removal of the tumor and shrinkage of

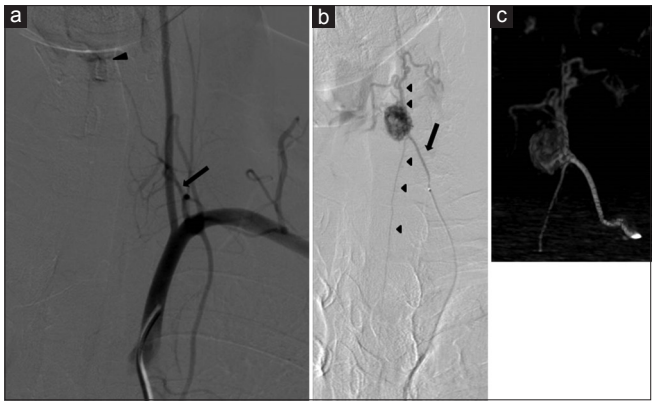

Figure 2: (a) Left subclavian artery angiogram showing the thyrocervical artery (arrow) as a feeder of the tumor (arrowhead). (b) Selective angiogram of the thyrocervical trunk showing the radicular artery entering (arrow) the spinal canal with the C8 root, branching of the anterior spinal artery (rostral and caudal) (arrowhead) and the feeding artery at C6, tumor staining, and the draining vein. (c) Three-dimensional rotational selective angiogram of the thyrocervical trunk showing the tumor location and surrounding vessels

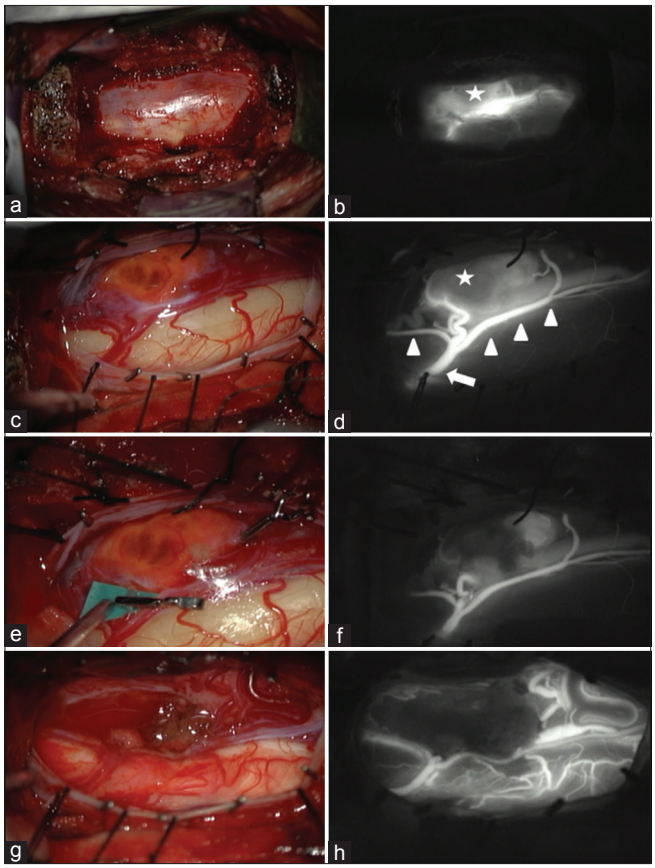

Figure 4: Surgical microscopic images. (a) After total corpectomy of C6 and partial corpectomies of C5 and C7. (b) Indocyanine green (ICG) injection showing the tumor stain (star), the anterior spinal artery, and surrounding venous drainage. (c) Opening of the dura mater exposed these structures. (d) ICG injection clearly showing the anterior radicular artery (arrow), anterior spinal artery (arrowheads), and the tumor (star). (e) Temporary clip was applied to the feeding artery of the tumor. (f) ICG injection showing reduced blood supply. (g) Dissection of the tumor. (h) ICG injection showing no residual tumor and the intact anterior spinal cord artery

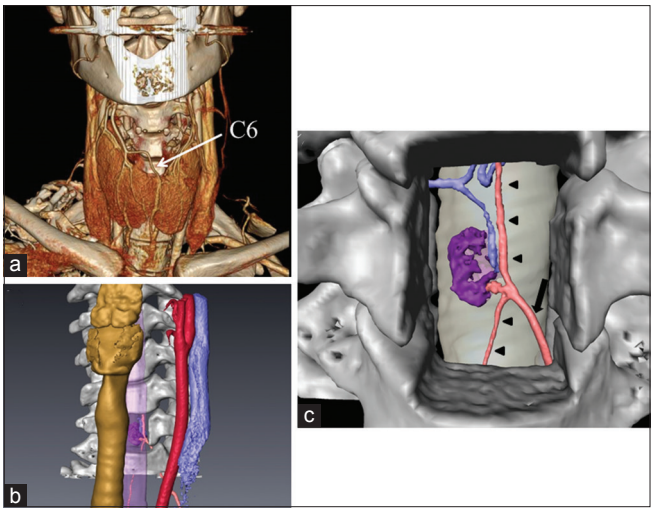

Figure 3: (a) Three-dimensional (3D) computed tomography angiogram showing C6 and surrounding structures. (b) 3D computer graphic image showing the anatomical relationships of the spinal tumor (purple) and feeding artery (pink), and the cervical vertebral bodies (white), trachea (yellow), esophagus (purple), common carotid artery (red), and jugular vein (blue). (c) Planned corpectomy of C6 and simulated surgical view showing the anterior radicular artery (pink and arrow), anterior spinal artery (pink and arrowheads), tumor (purple), and drainer (blue)

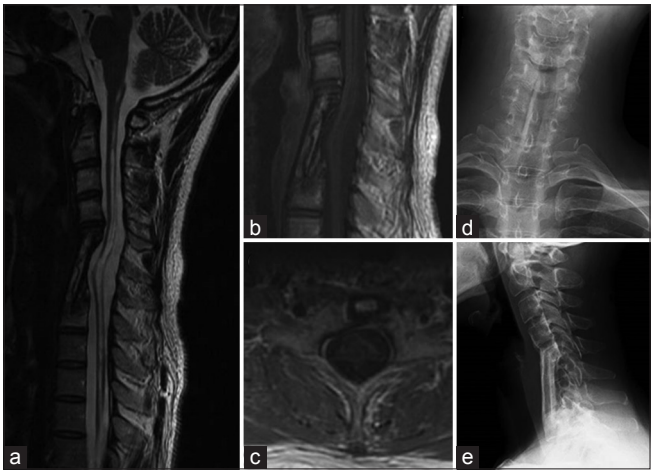

Figure 5: Follow-up MR images 1.5 years after the surgery. (a) Sagittal T2-weighted MR image showing disappearance of the tumor and collapse of the syrinx. (b and c) Sagittal (b) and axial (c) Gd-enhanced MR images revealing total removal of the tumor. (d and e) Postoperative cervical radiographs, anteroposterior (d) and lateral (e) views, showing good graft bone fusion

the associated syrinx. The pathological diagnosis was hemangioblastoma. The halo vest external fixation was removed 2 months after the surgery and replaced with a neck collar until confirmation of adequate bone fusion. Follow-up MR imaging at 1.5 years confirmed total removal of the tumor and shrinkage of the associated syrinx with accompanying atrophy of the spinal cord [Figures 5a-c] and cervical radiographs showed the grafted fibula bone fused to both the caudal and rostral vertebral bones [Figure 5d and e].

DISCUSSION

The standard surgical approach to intramedullary spinal cord tumor is posterior and typically involves laminectomy or laminoplasty.[8] Here, after 3D computer simulation our anterior approach provided adequate and safe access for excision of this intradural intramedullary anterolateral tumor at the C6 level.

In the present case, meticulous microsurgical dissection of proximal portions of the feeding artery allowed temporary arterial occlusion with a Sugita AVM Microclip at the tumor edge [Figure 4e and f]. ICG videoangiography[4] was then combined with temporary artery occlusion[3] to differentiate the feeding artery from those supplying the spinal cord. Continuous ICG videoangiography before and after tumor removal helped confirm complete excision of tumor with adequate preservation of the ASA [Figure 4g and h].

CONCLUSION

This case study demonstrates how anterior resection (e.g., C5-C7 partial/complete corpectomy/plating) of an anterolateral intramedullary C6 hemangioblastoma may be successfully achieved. Planning based on presurgical simulation with 3D computer graphic images and intraoperative ICG videoangiography with temporary artery occlusion under neuromonitoring helped achieve safe gross total excision of this lesion with preservation of the ASA.

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Conflicts of interest

The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

REFERENCES

1. Baleriaux DL. Spinal cord tumors. Eur Radiol 1999;9:1252-8.
2. Brotchi J. Intrinsic spinal cord tumor resection. Neurosurgery 2002;50:1059-63.
3. Clark AJ, Lu DC, Richardson RM, Tihan T, Parsa AT, Chou D, *et al*. Surgical technique of temporary arterial occlusion in the operative management of spinal hemangioblastomas. World Neurosurg 2010;74:200-5.
4. Hwang SW, Malek AM, Schapiro R, Wu JK. Intraoperative use of indocyanine green fluorescence videography for resection of a spinal cord hemangioblastoma. Neurosurgery 2010;67(3 Suppl Operative):ons300-3.
5. Iwasaki Y, Koyanagi I, Hida K, Abe H. Anterior approach to intramedullary hemangioblastoma: Case report. Neurosurgery 1999;44:655-7.
6. Martin NA, Khanna RK, Batzdorf U. Posterolateral cervical or thoracic approach with spinal cord rotation for vascular malformations or tumors of the ventrolateral spinal cord. J Neurosurg 1995;83:254-61.
7. Oppenlander ME, Spetzler RF. Advances in spinal hemangioblastoma surgery. World Neurosurg 2010;74:116-7.
8. Pluta RM, Wait SD, Butman JA, Leppig KA, Vortmeyer AO, Oldfield EH, *et al*. Sacral hemangioblastoma in a patient with von Hippel-Lindau disease. Case report and review of the literature. Neurosurg Focus 2003;15:E11.
9. Watanabe K, Watanabe T, Takahashi A, Saito N, Hirato M, Sasaki T. Transcranial electrical stimulation through screw electrodes for intraoperative monitoring of motor evoked potentials. Technical note. J Neurosurg 2004;100:155-60.